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(54) A ball valve

(57) A ball for a ball valve has a first through hole therein for the normal passage of liquid therethrough, and a second through hole (14) therein in which is located a pressure relief valve (16).

The pressure relief valve (16) comprises a valve body (17) having a through hole therein, a valve member (18) slideably mounted in the through hole, and resilient biasing means (20) for biasing the valve member (18) into sealing engagement with a valve seat. As the pressure on the valve member (18) rises above that exerted by the resilient biasing means (20) the valve member (18) is raised from the valve seat allowing pressure to be relieved through the through hole in the valve body (17).

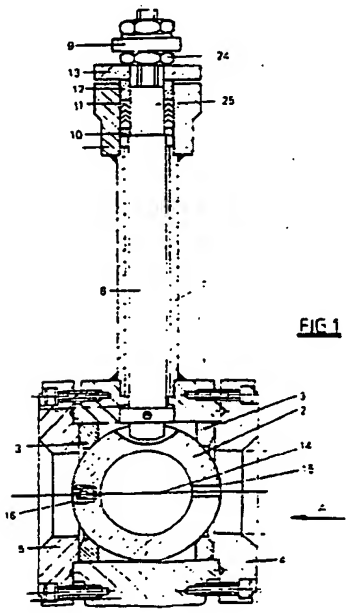

FIG 1

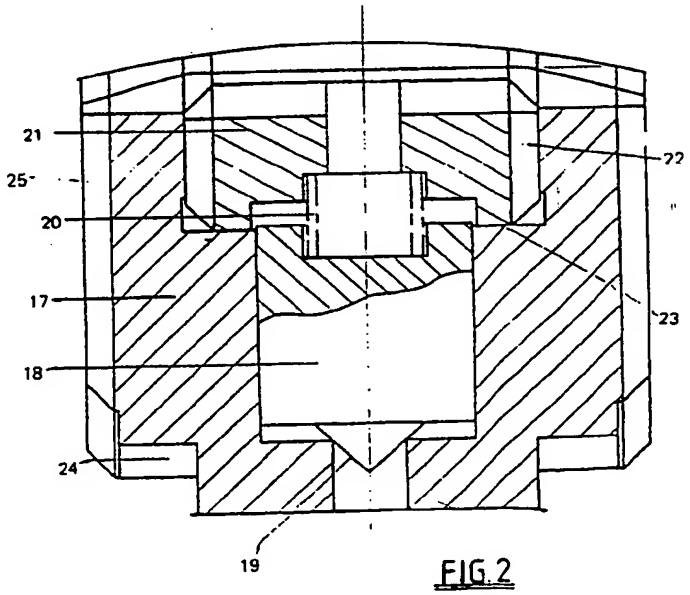

FIG 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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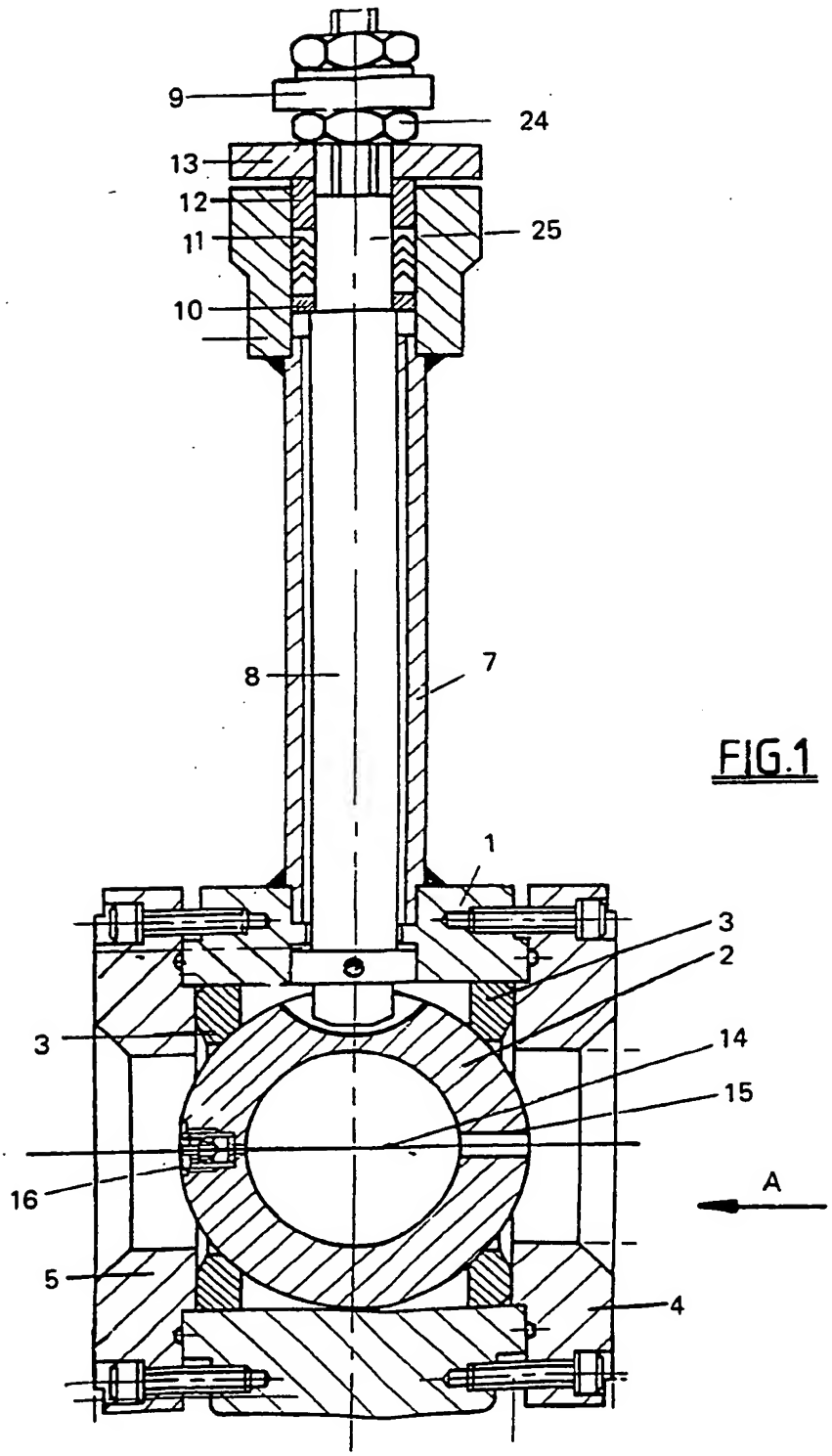

FIG.1

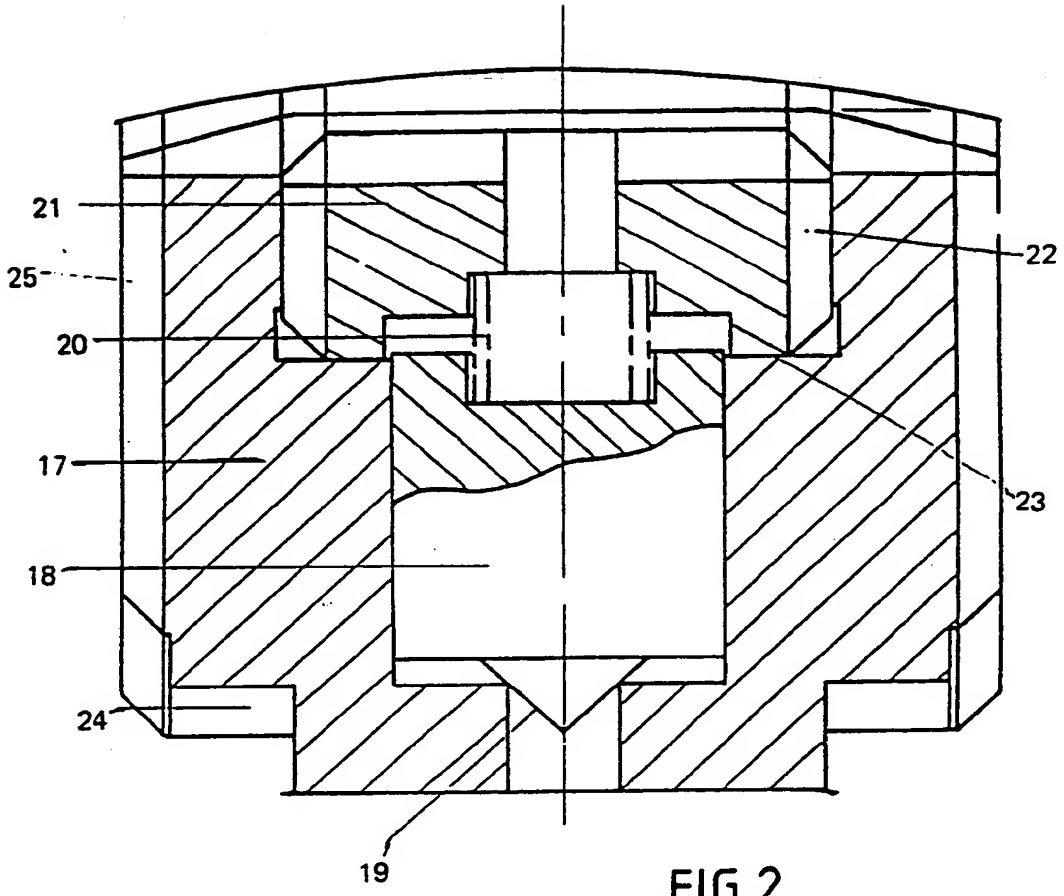

FIG. 2

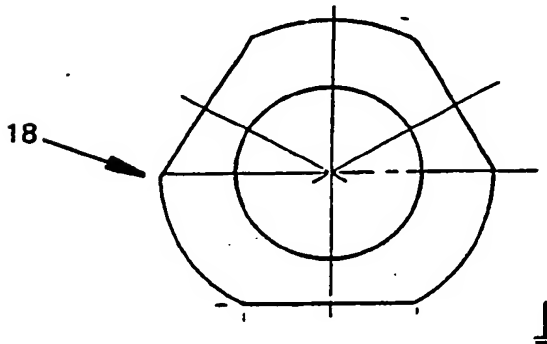

FIG. 3

DESCRIPTION

A BALL VALVE

The present invention relates to a ball valve. More especially, the present invention relates to a ball valve for use in pipelines conveying liquids.

Ball valves are commonly used to control the flow of liquid through pipelines. As the name implies a ball valve comprises a ball shaped valve member having a through hole therein rotatably mounted in a through passage in a valve body. As the valve member is rotated within the valve body the through hole in the valve member is aligned with the through passage in the valve body, thereby allowing liquid to flow through the ball valve. The valve member is rotated in the valve body by means of an external lever, handle or wheel which is connected to the valve member by a stem which extends through the wall of the valve body. This external lever can be operated manually or, as is often the case in large installations, by means of a remotely controlled actuator device.

With many liquids which are conveyed through a pipeline deposits or a "crust" of material can form on the internal wall of the pipeline unless the tempurature of the pipeline is maintained above a certain level. Should such a crust form it will, eventually, block the pipeline altogether with potentially disasterous results. In order to prevent a crust from forming it is known to

provide heaters around each section of pipeline which maintain the tempurature of the pipeline above the level at which the crust would otherwise form.

Sometimes, it may be necessary to close of a section of pipeline by closing ball valves provided at each end of the section for this purpose. Unfortuneately, it may not be possible to turn off the heater associated with that section of pipeline whilst it is isolated because of the risk of a crust forming. As a consequence the tempurature of the liquid in that section and, thence, the pressure are increased. Where the liquid has a high co-efficient of expansion the increase in pressure can be enough to be potentially explosive and, therefore, some means for relieving the excess pressure must be provided. This means usually takes the form of a pressure bursting disc located in the wall of the pipeline section which will burst at a given pressure, thereby allowing the liquid to escape from the pipeline.

The liquid may be released through the bursting disc directly into the environment, but more usually, and especially with environmentally dangerous liquids, a receptacle is provided to receive the escaping liquid. Even where the liquid can be released directly into the environment it is usually necessary to carry out some sort of cleaning up operation, which is both inconvenient and expensive, and where the liquid is received in a receptacle there is still a risk of spills and leaks

occuring. In either case it will be apparent that the liquid is not retained in the pipeline itself which is the safest and most convenient place for it. A further disadvantage of bursting discs is that once one bursts the pipeline cannot be put back into use again until it has been replaced.

It is an object of the present invention to provide a ball valve which allows excess pressure in a section of pipeline to be relieved through the ball valve into the section of pipeline beyond, thereby obviating the disadvantages associated with conventional pressure relief means.

According to a first aspect of the present invention there is provided a ball for a ball valve having a first through hole therein for the normal passage of liquid therethrough, and a second through hole therein in which is located a pressure relief valve.

Preferably, the second through hole passes through the first through hole, and the central axis of the first through hole defines a right angle with that of the second through hole.

Preferably, the pressure relief valve comprises a valve body having a through hole therein, a valve member slideably mounted in the through hole, and resilient biasing means for biasing the valve disc into sealing engagement with a valve seat. As the pressure on the valve member rises above that exerted by the resilient

biasing means the valve member is raised from the valve seat allowing pressure to be relieved through the through hole in the valve body. Preferably, the valve seat is defined by an internal wall of the valve body.

Preferably, the valve member comprises a glass filled PTFE disc. Alternatively, it may take the form of a ball.

Conveniently, one end of the second through hole is tapped and the valve body comprises a screw threaded portion which enables it to be screwed therein.

According to a second aspect of the present invention there is provided a ball valve comprising a ball in accordance with the first aspect of the present invention.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig 1 shows a section through a ball valve comprising a ball in accordance with the present invention;

Fig 2 shows an enlarged sectional view of the relief valve provided in the ball valve of Fig 1; and,

Fig 3 shows plan view of the relief valve disc of the relief valve of Fig 2.

Referring to Fig 1 of the accompanying drawings there is shown a ball valve comprising an annular body 1 within which is located a ball 2 according to the first

aspect of the present invention. The diameter of the ball 2 is substantially equal to the inner diameter of the annular body 1, such that the ball 2 fills the passageway defined by the annular body. An annular valve seat 3 is provided at each end of the annular body 1 and these valve seats 3 are maintained in tight, sealing engagement with the ball 2 by means of an upstream endplate 4 and a downstream endplate 5, respectively. In use, the ball valve is connected in a pipeline to regulate the flow of liquid therethrough, and for the avoidance of doubt liquid flows through the ball valve in the direction of arrow A. The valve seats 3 ensure that, in use, liquid does not leak round the ball 2, through the space between the ball 2 and the inner wall of the annular body 1.

A hole is provided through the top of the annulur body 1, and extending from and continuous with this hole is an extension tube 7. Located within the extension tube 7 is a stem 8 which is connected to the ball 2 at one end and to a handle 9 at the other. The stem 8 is sealed within the extension tube 7 by means of a stem packing assembly consisting of a gland ring 10, a plurality of chevron rings 11, a gland follower 12 and stop 13. The stem packing assembly is clamped down onto the end of the extension tube 7 by means of a nut 24 which is screwed onto a screw threaded portion 25 at the end of the stem 8. As will be readily appreciated, the ball 2 can be rotated about its vertical axis within the annular body 1

by turning the handle 9. As will be explained hereinbelow this opens and closes the ball valve.

A through hole extends through the ball 2 perpendicular to the axis of rotation of the ball 2, and in Fig 1 this hole is shown end on and lying transverse to the longitudinal axis of the valve body 1. When the ball 2 is in this position the passageway through the annular body 1 is occluded and the ball valve is closed to the passage of liquid. However, when the ball 2 is rotated about its vertical axis the alignment of the through hole with the passageway through the annular body 1 is gradually increased. As thus far described the ball valve of Fig 1 is of conventional design.

A second through hole also extends through the ball 2 and this traverses the first through hole and lies perpendicular to the axis of rotation of the ball 2. The longitudinal axis of this second through hole is indicated in Fig 1 by reference 14. One end of the second through hole, indicated by reference 15, is open to admit liquid from the upstream end of a pipeline when the ball valve is closed to the normal flow of liquid. A pressure relief valve, generally indicated by reference 16, is provided in the opposite, downstream end. This pressure relief valve 16 is, of course, normally closed, but should the pressure in the upstream side of the pipeline exceed a predetermined level whilst the ball valve is closed, the pressure relief valve 16 will open to allow

liquid to pass through the second through hole and out into the downstream side of the pipeline.

Referring now to Figs 2 and 3 of the accompanying drawings there is shown a pressure relief valve for use in the ball valve of Fig 1. The pressure relief valve comprises a valve body 17 defining a through hole therein and a screw-tapped outer surface 25 which enables the pressure relief valve to be screwed into a correspondingly tapped hole in the ball valve. A glass filled PTFE disc 18 is slideably received in the through hole in the valve body 17 and comprises a conical portion 19 which is adapted in use to be resiliently biased into sealing engagement with a valve seat defined by the narrowest end of the through hole in the valve body 17. The resilient biasing is provided by a compression spring 20 which is compressed between the disc 18 and an adjusting screw 21. The adjusting screw 21 comprises a screw threaded portion 22 which enables it to be screwed into a correspondingly screw tapped portion of the through hole in the valve body 17.

As will be readily appreciated, the further the adjusting screw 21 is screwed into the through hole in the valve body 17 the greater is the compression of the compression spring 20, and hence, the greater is the pressure required to lift the disc 18 off the valve seat. In order to ensure that the pressure relief valve always operates at a predetermined relief pressure, the

adjusting screw 21 is screwed fully into the valve body 21 against an internal shoulder 23 of the valve body 17.

A PTFE seal 24 is provided around the end of the relief valve to ensure that there can be no pressure leaks around the pressure relief valve.

As can clearly be seen in Fig 3 the sides of the disc 18 are flattened at intervals around its circumference. This feature ensures that the disc 18 is held in place within the valve body 17 and is prevented from moving laterally therein, but allows room between the inside wall of the valve body 17 and the disc 18 itself for the passage of liquid past the disc 18 when the disc 18 is raised from the valve seat by excess pressure in the upstream side of a pipeline. To complete the pressure relief path through the pressure relief valve the adjusting screw 21 also defines a through hole therein and when it is screwed into the valve body 17 this through hole is continuous with the through hole in the valve body 17.

In use, the ball valve according to the present invention is positioned in a pipeline. As indicated above, when the ball valve is open the first through hole is aligned with the pipeline and thus liquid is allowed to flow freely through the ball valve. When the ball valve is closed the second through hole is aligned with the pipeline, though, of course, liquid is normally prevented from passing therethrough by the disc 18 in

sealing engagement with the valve seat. However, should pressure build up on the downstream side of the pipeline, and hence on the disc 18, because, for example, the pipeline is being heated to remove deposits of material, until it reaches a point where it exceeds the load exerted by the compression spring 20 the disc 18 is lifted off the valve seat, thereby allowing liquid to flow through the open pressure relief valve and relieving the excess pressure. Liquid continues to flow through the open pressure relief valve, until the pressure on the downstream side of the pipeline drops to a point where it exerts less load on the disc 18 than does the spring compression spring 20. At this point the disc 18 is reseated on the valve seat and any further flow of liquid is prevented.

In an alternative embodiment of the present invention the disc 18 is replaced by a ball.

CLAIMS

1) A ball for a ball valve having a first through hole therein for the normal passage of liquid therethrough, and a second through hole therein in which is located a pressure relief valve.

2) A ball according to claim 1, wherein the second through hole passes through the first through hole, and the central axis of the first through hole defines a right angle with that of the second through hole.

3) A ball according to claim 1 or 2, wherein the pressure relief valve comprises a valve body having a through hole therein, a valve member slideably mounted in the through hole, and resilient biasing means for biasing the valve member into sealing engagement with a valve seat.

4) A ball according to claim 3, wherein the valve seat is defined by an internal wall of the valve body.

5) A ball according to claim 3 or 4, wherein the valve member comprises a glass filled PTFE disc.

6) A ball according to claim 3 or 4, wherein the valve member takes the form of a ball.

7) A ball according to any one of claims 3 to 6, wherein one end of the second through hole is tapped and the valve body comprises a screw threaded portion which enables it to be screwed therein.

8) A ball valve comprising a ball in accordance with any one of claims 1 to 7.

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